

## Quick Questions 8      Probability Part II      Multiplication Rules

I. Place the letter of the appropriate definition or formula next to the concept it defines.

1. General rule for multiplication		A. $P(A \text{ and } B) = P(A) \times P(B)$
2. Independent events		B. Marginal probability
3. Special rule for multiplication		C. $P(A \text{ and } B)$
4. $P(A)$		D. Event A does not affect the probability of event B
5. Counting rule		E. $P(A \text{ and } B) = P(A) \times P(B   A)$
6. Combination rule		F. $P(A) \times P(B A) + P(\bar{A}) \times P(B \bar{A})$
7. Joint probability		G. $(M)(N)$
8. Denominator of Bayes' theorem		H. N items can be arranged N! ways
9. Factorial rule		I. $\frac{N!}{(N-R)!}$
10. Permutation rule		J. $\frac{N!}{(N-R)!(R!)}$

**Note** that G represents how two sets of items can be ordered and H, I, and J represent how one set of items can be ordered.

II. Complete this chart concerning the number of hours students studied for a test and their exam grades.

Hours studying	Less than 4	Greater than or equal to 4	Total
<b>Test score</b>			
Less than 85		2	10
Greater than or equal to 85	2		
Totals		10	

III. Use a formula and the data in question II to answer the following questions.

A. The probability of earning a grade less than 85.

B. The probability of someone studying 4 or more hours and earning a grade of 85 or higher.

C. Was the special rule of multiplication applicable to question B? Why or why not?

- D. Use Bayes' theorem to calculate the probability of someone scoring 85 or higher if they studied 4 or more hours.

- E. Prove your answer to question D using the chart on page 50.

Final Exam Score (%)	Number of Papers Graded	Probability $P(x)$
85.00	30	$0.30 = 30/100$
80.00	15	$0.15 = 15/100$
75.00	10	$0.10 = 10/100$
70.00	30	$0.30 = 30/100$

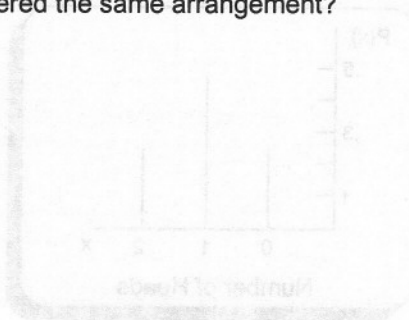
- IV. How many stores will a salesperson visit if they must visit 3 locations in each of 4 cities?

- V. An advertising manager has 6 advertisements of equal size to place horizontally across a magazine page.  
 A. How many ways can the 6 ads be arranged?

- B. How many ways can 4 of the 6 ads be arranged if order counts?

- C. How many ways can 4 of the 6 ads be arranged if order does not count and a, b, c, d and d, c, b, a are considered the same arrangement?

Number of Heads	Probability $P(x)$
0	0.0625
1	0.25
2	0.375
3	0.25
4	0.0625



$$P(x) = \frac{n!}{k!(n-k)!} p^k q^{n-k}$$

$$P(0) = \frac{4!}{0!(4-0)!} (0.5)^0 (0.5)^4 = 1 \cdot 1 \cdot 0.0625 = 0.0625$$

$$P(1) = \frac{4!}{1!(4-1)!} (0.5)^1 (0.5)^3 = 4 \cdot 0.5 \cdot 0.125 = 0.25$$

$$P(2) = \frac{4!}{2!(4-2)!} (0.5)^2 (0.5)^2 = 6 \cdot 0.25 \cdot 0.25 = 0.375$$

$$P(3) = \frac{4!}{3!(4-3)!} (0.5)^3 (0.5)^1 = 4 \cdot 0.125 \cdot 0.5 = 0.25$$

$$P(4) = \frac{4!}{4!(4-4)!} (0.5)^4 (0.5)^0 = 1 \cdot 0.0625 \cdot 1 = 0.0625$$